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THIRTY YEARS OF THE SOVIET COKE BY-PRODUCTS INDUSTRY

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Production of coke in 1913 was only 4.5 million tons. The production of coke by-products was very poor; more than 70 per cent of the coke ovens operated without collecting the gas and chemical products.

Only a small part of the ovens collected ammonia, tars, and benzene, usually without processing them further. Such products as toluene, benzene, solvent, anthracene, and naphthalene were imported.

World War I served to a certain extent as a stimulus for the construction of plants collecting coke-chemical products and processing tars and crude benzene. In the first years of the war the Konstantinova, Ol'khovskiy, Wiktovskiy, and Bryansk coke plants, the Kediyskiy rectification plant, and others were put in operation.

The relative amount of ccke produced in plants with collectors increased from 29.4 per cent in 1913 to 42.2 per cent in 1915.

In 1920, after the postwar intervention, a plan was developed for starting the coke enterprises and in 1921 a number of the Donbass plants -- Rutenkovskiy, Yemaidyevskiy, Makeyevsk, and Stalinsk--resumed the production of coke.

The Kramatorskiy and Mushketovskiy plants, with collectors of products of coking, were completed in 1923 and 1925 respectively. The prewar level of production (1913) was surpassed in 1929. Coke production in furnaces with collectors reached 83 percent in that year.

Beginning with 1927 the Soviet Union started the construction of modern coke by-products plants: Voroshilovsk, Gorlovka, Novo-Makeyevka, Rutchenskoykiy, Dnepropetrovsk, Dneprodzerzhinsk, and Kerchensk. All of these plants process Donets basin coal.

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The Magnitogorsk, Duznetak, and Nizhne-Tavil' plants, the Kemerovo coke by-products plant, and the Gubakhinskiy plant were developed to supply the chemical industry and nonferrous metallurgy of the Urals. New ovens were built (from Dinas) with highly productive combination heating and large capacity. Foreign firms began the construction with imported refractory material and equipment.

In order to supply the plants of the East with raw materials, considerable work was done on the study and use of the Kuznetsk, Karagandinskiy, Kizelovskiy, and Vostochno-Sibirskiy coal basins.

At the beginning of the Second Five-Year Plan, the operators of the coke by-products industry were assigned the task of freeing the industry from dependence upon foreign technology. In particular, Giprokoks modernized the system of furnaces which had been installed earlier (Becker) and by the end of the second Five-Year Plan all coking batteries were constructed according to the Giprokoks-Becker system.

The technical level of the coke by-products industry rose with each year, which is shown by the rise in the average annual production per oven (tons):

<u>1913</u>	<u>1932</u>	<u>1937</u>	<u>1940</u>
800	1810	3140	4160

The relative value of production of coke in Dinas ovens also constantly increased (percent):

<u>1929</u>	<u>1932</u>	<u>1937</u>	<u>1940</u>
17	53	75	91

In 1913 the production capacity of the majority of plants was 100,000 - 200,000 tons per year; out of 37 enterprises at this time, 31 calcinated not more than 200,000 tons per year and only certain plants had a capacity of 500,000 tons. In 1940, of 31 enterprises, 10 produced more than one million tons per year.

The national economic interest demanded not only the complete and most expedient utilization of coke gas, but also proper use of excess blast-furnace gas. This was possible only with the allocation of coke by-product installations to metallurgical plants, which was done in the construction of almost all new plants. Therefore, for the years of the Stalin Five-Year-Plans the relative capacity of coke by-product enterprises located with metallurgical plants increased to the following (percent):

<u>1913</u>	<u>1929</u>	<u>1932</u>	<u>1936</u>	<u>1940</u>
28.4	44.2	54.5	71.3	73.8

Such a distribution made it possible to use blast-furnace gas for heating coke ovens by the end of the First Five-Year Plan.

The discharge of coke gas in metallurgy in 1940 had increased sevenfold in comparison with that of 1933 and reached 4.2 million cubic meters. The production of coke in 1940, in comparison with the indices of 1913 and 1929, had increased fourfold and was 20.9 million tons.

A new hydraulic process for coke ovens, based on constant positive pressure inside the coke chamber for the whole period of coking, was developed in 1937. This process, installed in many plants, showed a positive influence on increasing the period of service of the ovens.

In 1940, 70 percent of the coal subjected to concentration in the USSR was concentrated in the coal-concentrating plants of Glavkoks. This largely contributed to an improvement of the quality of coke.

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Along with the growth of the calcination of coke went the development of the production of chemical products of coking. The majority of coke by-products plants already had full production, including processing of coal tar and crude benzene. The collection of chemical products of coking in 1940 in comparison with that of 1913 had increased tenfold, not only as a result of the increase in the amount of coal processed but also because of the improved coking and collecting methods.

The improvement of the work of collecting plants is characterized by the following indices of the outputs of basic products in 1930 and 1940 (percent):

	1930	1940
Water-free tar	2.22	2.93
Ammonia, 100 percent	0.187	0.222
Crude benzene	0.418	0.761

Ammonia, as a rule, is collected in all new plants in the form of ammonia sulphate, while tar and benzene are processed completely.

The demand for products of tar and benzene processing has constantly increased. A semiconstant method of final rectification was introduced into plants for rectification of crude benzene. The number of products produced by phenol plants was increased. Plants became familiar with the production of light and heavy pyridine bases, coumarone rosin, and other valuable products.

The workers of Giprokoks, numbering approximately 300 engineers and technicians, created a new Soviet design for coke ovens (Giprokoks system). These ovens were installed in the Khar'kov experimental plant and received a good rating in tests. Considerable success was attained by Giprokoks in the field of standardization of equipment of ovens and chemical apparatuses (coolers, benzene and rectification columns, etc.).

During World War II the construction of coke batteries was widely developed simultaneously in all plants of the East: Magnitogorsk, Kuznet'sk, Kemerovo G - bakhinskiy, Tagil', and Chelyabinsk.

In 1941, construction was begun on several batteries each year. Equipment which had been evacuated from southern Russia was reassembled and installed. Chemical plants for collecting and processing tars and benzene were constructed and expanded. The Kemerovo plant became familiar with the production of products formerly produced by the phenol plant in the Donbass.

The production of electrode coke, crystalline and sublimated naphthalene, pure pyridine, alpha and beta picoline, lubricating oils, saccharine, and other products were developed.

As a result of the intensified labor of the operators of the eastern coke by-products industry, together with that of the evacuated workers of the southern plants, by 1945 the eastern coke by-products plants and factories had doubled coke production in comparison with 1940. The increase in production of chemical products was significantly greater.

During the war the Zaporozhe, Dneprodzerzhinsk, Mariupol', Novo-Makeyevka, Novoyenakiyevskiy, Gorlovka, and Mushketovskiy plants suffered the greatest destruction.

With each day the tempo of plant restoration in the south increases. At present, all except three plants are operating. The Zaporozhe coke by-products plant is ready to resume operation.

The new Stalin Five-Year Plan calls for complete restoration of the coke-by-products industry of southern Russia and the opening of 63 coke batteries with a capacity of 19.1 million tons per year, boosting the productivity of the industry in 1950 to 30 million tons of coke, which will be 143.8 percent of prewar production.

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